

BBRRCT Science Meeting Discussion

Following the presentations on seagrass dieoff in the Julie Tuttle Basin, members of the BBRRCT entered into discussions with guest speakers and meeting guests. The main points made in the discussions are summarized below under different general topic categories and under Next Steps.

Land-based Inputs into the Bay

Pump stations on Miami Beach and elsewhere were brought up as possibly contributing to declines in water quality in the Bay and in the seagrass dieoff observed in the Julie Tuttle Basin. More stations will be installed in the future, so it is important to know the contribution from this source.

Commissioner Cava asked about actions that may be needed to correct the situation and to promote healthy grassbeds, including enforcement actions. She inquired about the permits issued for the pumps. DERM issues pump station permits.

The Little River has a pump station installed in 2011. Other pump stations exist that predate the newest ones in Miami Beach. The Little River has seen high chlorophyll-a levels; FDEP/BBAP (Laura Eldridge) has water quality data that might be useful in identifying sources of nutrients. Little River discharges are likely to affect the west side of the bay.

The USGS CARTH program has data from king tides collected from 16 water quality stations around the Bay. These data are available.

Miami Beach just began water quality monitoring. These data will be available in the future, after a full year's worth of sampling has taken place.

SFWMD all nutrient concentrations and flow rate data are publically available.

Seawater Temperatures

There may have been anomalously high seawater temperatures around the time the dieoff began. What role could temperature have played?

Seawater temperatures can affect seagrasses. Higher temperatures mean lower dissolved oxygen in the water column. Dr. Fourqurean explained that in Florida Bay dieoffs, toxic sulfur killed the meristem of the plant shoots and the plants died. The underground biomass, including the rhizomes, of the turtle grass were deprived of oxygen needed to keep the toxic sulfur away. The result was death of the plant and widespread dieoffs. Low DO conditions have been observed in the late fall in Florida bay when temperatures are high.

Drs. Hall and Fourqurean both agreed that higher seawater temperatures could have played (may be playing?) a role in the Biscayne Bay dieoff. Dr. Fourqurean added that bio-utilization by animals' increases with increasing temperatures, which lowers the DO even more. It may be that even a slight increase in temperature could affect seagrasses in a small basin like Julie Tuttle. He has not seen a time series of temperature data for that basin, though.

Dr. Nicole Millete indicated that AOML data shows an increasing trend in temperature for all of Biscayne Bay, but the increases over time are not overly dramatic.

Sarah Bellmund stated that the BNP Salinity Network data showed a slight increase in temperature around the timeframe of the dieoff.

In response to how seagrasses are expected to respond to changes in pH, seagrasses evolved under conditions that allow them to survive in higher acidic conditions. Changes in the ocean's acidity probably will not negatively affect seagrasses.

Nature of the Dieoff

Dr. Hall observed that the dieoff proceeded in a directional way from North to South and not so much from the outside in. She is curious as to what would explain this pattern.

Eric Buck indicated that there is dieoff on the south end, too.

The borrow pit on the south end makes sampling difficult there and some areas are too shallow to sample properly.

Chris Avila stated that the dieoff began in the deeper remnant (no longer used) channels. These channels are visible in the Google Earth images.

Dr. Mark Fonseca emphasized there is an acceleration component to this process that is important to consider. The seagrass literature describes the typical collapse of a grassbed related to water quality. Nutrients from land create conditions unfavorable for grasses, which leads to the loss of seagrasses. When grasses die, decomposition releases more nutrients into the water column, which leads to lower light conditions that further stress the grasses.

Dr. Fonseca suggested looking for extreme events that may have contributed to this dieoff. Short-term events can precipitate something like this and begin the cascading effects. There is a notion that grassbeds have high stability. State changes can take place relatively quickly with extreme events. Sometimes, they reverse themselves over time (grassbed comes back). Multiple factors can contribute to shifts in the community.

Chris Avila noted that shoot densities were extremely high in Julia Tuttle Basin where the dieoff took place.

Could the Little River be a source of nutrients? A low DO value was measured there in Jan 2014 and a trend of decreasing pH. Chris noted that in 2016 for the first time, the entire bay was out of compliance for chlorophyll values. Fecal coliform exceedances were high in 2016, too.

In response to a question asked about by Commissioner Cava about setting and achieving goals to have healthy seagrass, Chris Avila and Jamie Monty explained that in determining goals, they would use scientific information to identify where grasses should be found naturally in the bay. Then, if grasses are not healthy where they should occur naturally, they would take steps to find out what is affecting grasses and determine how to make changes on land that were impacting them. Goal setting involves working backwards somewhat using scientific information. Dr. Markely explained that for the bay it would be a similar to the process taken to determine that 10 ppb levels for phosphorous in the Everglades.

Chris Avila stated that he would look for nutrient sources on land. Phosphorus levels are higher in the east where canals enter the bay. The suggestion was made that Miami-Dade look at its

data for long-term trends in turbidity and other factors that might affect water quality/seagrasses in the bay.

Craig Grossenbacher explained that water from the Everglades Agricultural Area (EAA) south of Lake Okeechobee is not causing the nutrient problem in Biscayne Bay. Water from the EAA is cleaned-up before it enters the system and is picking up nutrients from the urban core in Miami-Dade before reaching the bay. Groundwater in the county is somewhat degraded, too. Fecal coliform from septic systems is implicated.

Palm Beach County is addressing a similar issue with Lake Worth Lagoon. The lagoon experienced *Syringodium* dieoff beginning in January 2014 and they are now investigating the cause. This observation points to the notion that this may be a regional phenomenon.

Dr. Markley added that in some cases the numeric nutrient criteria (created for nearshore waters and adopted by FDEP) might not be protective enough to achieve restoration goals and/or maintain the existing community. Dr. Fourqurean noted that the numeric nutrient criteria were set using baseline data from earlier years and that method is a somewhat questionable since declines could have been underway during the collection of the baseline data. For this reason the criteria may not be protective enough. Sarah Bellmund, Biscayne National Park, indicated that the numeric nutrient criteria that were set for the park waters (state waters) were derived based on an analysis that the park had done. These same criteria from the study were adopted by the state as the standards.

Turbidity

A question was asked about limestone fines and how they respond to pH. Limestone grains can dissolve under certain conditions, but they can also precipitate back out again into the water column.

Craig Grossenbacher noted that there is a huge amount of legacy phosphorus contained in limestone of the area and if these fines dissolve, the phosphorus and any other substances are released and become available in the water column.

DERM (Miami-Dade) monitors water quality in the Bay. DERM has long-term turbidity data that could be examined to see the trends in turbidity.

The Port of Miami dredging process did not consider how the grasses growing in a small basin such as Julie Tuttle Basin may be affected by the phosphorus released by limestone fines.

Dan Kipnis offered observation that huge turbidity observed on incoming tide during Port of Miami dredge construction. The west side of Miami Beach was affected by this turbidity. The turbidity in this basin was huge and made it up to Julie Tuttle basin where it was observed for two years. This area was outside of the turbidity monitoring required for the project. He added that turbid water was not flushed out with the outgoing tides. Once it entered the bay, it flowed northward to Government Cut and remained there for a while.

Dan Kipnis observed that in the area of the dieoff, the fines there now will probably prevent reestablishment of the grass. The grains are too fine for plants to take hold in. He also observed that in the Island Gardens mitigation site near Mt. Sinai hospital, the capping layer is being removed with boat traffic—fines are being floated off with wake from boats.

Dan Kipnis observed that the boat wakes generated from boaters in the northeast corner keeps the fines suspended in the water column. Boat traffic would have less impact if the boats were slowed down and wakes were reduced. It was noted that the nature of the shoreline may play a role in the effects of boat wakes.

Boat traffic in the ICW seems to be busier on the west side compared to the east side and yet the west side experienced less dieoff. It was pointed out that the ICW has a Manatee speed zone from November to April that slows boats down on the west side. On the east side, they can go up to 30 mph. It was also mentioned that the small islands provide an outlet for water movement and therefore help distribute the wake and dampen the movement associated with wakes.

Bay Ecology/Past Studies

Dr. Joe Serafy NOAA fisheries scientist conducted trawl sampling in the bay 20 years ago and found that the North Bay was a juvenile sea trout nursery and habitat.

Dr. Markley stated that assessments of invertebrates and fish fauna conducted in Biscayne Bay in the late 1970s--early 1980s found that the relative abundance of pink shrimp and juvenile sea trout was higher in Julia Tuttle Basin than elsewhere in bay. This basin had a productive grass habitat responsible for supporting juveniles and served as a nursery. The studies can be found in the RSMAS library.

Dr. Joan Browder indicated that her pink shrimp studies in the past showed that Julie Tuttle Basin had a high pink shrimp abundance.

Next Steps discussion

The idea of developing a plan for the Biscayne Bay Restoration Initiative was brought up.

Dr. Fourqurean explained that Florida Bay was a success in terms of investigating the cause of the dieoff and blooms because there was an interagency effort and federal funding applied to the effort. A panel provided oversight of the research being conducted and brought the matter to the attention of the agencies and academics. Once the political will is there, the money will follow and people will want to conduct research. He sees the need for an oversight committee to steer the direction of science and spatial design and to develop a cook book plan to see what agencies, students and citizens can do to contribute.

Dr. Serafy emphasized the need for real action, not just monitoring.

Individuals in different agencies can see what resources they can bring to the matter. Stakeholder support is also very important for developing a program.

Tom Jackson pointed out that he knows private citizens who are willing to fund water quality monitoring.

Holly Greening in Tampa Bay was involved in the long-term plan that addressed nutrients in the bay that were degrading seagrass beds. She is knowledgeable and can give guidance to the program. Dr. Hall, who is based in the Tampa Bay area, emphasized the importance of getting industry involved in order to solve the nutrient input issue. In Tampa, government worked closely with citizens and industry on this effort. A comprehensive management plan was

developed for Tampa Bay that included implementing Advanced Wastewater Treatment. Although it has taken years, they have seen the restoration of grassbeds in Tampa Bay.

Charlotte Harbor has also had some successes and Lisa Beaver can provide insights on this program.

The question was asked why Biscayne Bay is not designated as a bay of national significance. What is involved in becoming a bay of national significance?

Biscayne Bay is a NOAA Habitat Focus Area and perhaps that designation could help garner attention to bay issues/investigating the dieoff.

As part of the educational process, experts from Water and Sewer and DERM could be consulted and tapped to provide presentations. Experts on fertilizer ordinances, septic tanks, etc. could give presentations to BBRRCT.

Data Management

Support was expressed for a central location to store and share data. Eric Buck is going to look into this idea.

There is a need for a collaborative spirit on the part of everyone involved in terms of sharing and synthesizing data. Data should bubble up to decision-makers. Collaboration is the first step in moving forward.